Certificate of Translation

I, the undersigned, have prepared the English translation which is attached herewith, and hereby declare that the aforementioned translation is a true and correct translation of the officially certified copy of the Korean Patent Application No. 97-13493 filed on April 12, 1997.

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Translator: Jun Seo, Cha

Jun-Seo Cha

TITLE OF THE INVENTION

FLAT PANEL FOR CATHODE RAY TUBE

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates to a panel for a cathode ray tube, and more particularly, to a flat panel for a cathode ray tube in which external light reflection is minimized, appearance is improved, natural screen images may be achieved, and shadow mask may be applied.

(b) Description of the Related Art

In general, a cathode ray tube includes a phosphor screen applied with three red, green and blue colors, a shadow mask for selecting colors, an electron gun for emitting electron beams, and a deflection yoke for radiating the electron beams on the phosphor screen, wherein the electron beams of the three red, green and blue colors reach to respective phosphor substances passing through apertures formed on the shadow mask to form desired images.

The phosphor screen coated with the phosphor substances is provided to an inside of a panel forming a body part of the cathode ray tube with a funnel, wherein the panel is usually formed with a curved inner surface and a curved outer surface formed with a transparent glass plate.

The panel has, however, limitations in the reflection of external light and distortion of the screen as the outer surface is not flat. Therefore, in recent days, a flat panel, of which an outer surface is formed flat, is in the

spotlight and rapidly spreading.

As shown in Fig. 3, such a flat panel employs typically a panel 30, of which all the inner and outer surfaces 31,32 are formed flat, and a flat tension mask 33 having good tension force in horizontal and vertical directions for minimizing the degradation of screen quality due to a so-called doming phenomenon.

Further, a panel, of which an outer surface is formed flat and an inner surface has a curvature only in the horizontal direction, is utilized, wherein the panel employs an aperture grill which is applied with the tension force in the vertical direction considering the flat inner surface.

Fig. 4 shows a screen image 35 displayed to a user U at a distance apart from the flat panel 30 by a valid screen width size. In Fig. 3b, the screen image 35 which is substantially realized on an inner surface 32 of the flat panel 30 by eyes E refracted while passing through the outer surface is shown by the user U as if the screen image is positioned between the outer surface 31 and the inner surface 32.

Such a conventional flat panel has, however, a disadvantage in that a natural screen image may not be realized due to a screen distortion phenomenon wherein the screen image seems to be concave inwardly as the size becomes larger by the refracted eyes.

Further, the color selection function becomes limited to the flat tension mask or the aperture grill forming a mask surface by the tension force, so that it is impossible to compatibly use the flat panel in an existing cathode ray tube having a shadow mask.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a flat panel that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a flat panel for a cathode ray tube in which a screen image may be realized on the panel not to be shown concavely and an existing shadow mask may be employed.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a flat panel for a cathode ray tube includes an outer surface which is formed flat, and an inner surface which is formed non-spherically, wherein in the non-spherically formed inner surface, a screen image to be shown by a user at a distance apart from the panel by a valid screen width size satisfies formula 1,

$$y_2 \leq y_1 \quad \text{.....formula 1}$$

wherein y_1 represents a vertical distance between the outer surface and a refracted screen image on a central axis of the panel, and y_2 represents a vertical distance between the outer surface apart from the central axis of the panel and the refracted screen image.

The panel has a high transmission ratio of 60% or more for preventing the degradation of luminance due to a difference of thickness between the central part and the environmental part.

In the flat panel for a cathode ray tube constructed as above, the outer surface minimizes an external light reflection and improves its appearance, and the inner surface realizes natural images by preventing screen distortion due to the eyes refracted while passing through the outer surface.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Fig. 1 is a cross-sectional view showing a flat panel for a cathode ray tube according to a preferred embodiment of the present invention,

Fig. 2 is a view showing a relationship between a screen image realized on the flat panel for a cathode ray tube and a real inner surface according to the present invention,

Fig. 3 is a cross-sectional view showing a prior art panel, of which inner and outer surfaces are formed flat, and

Fig. 4 is a view showing a relationship between a screen image realized on the panel of the flat inner and outer surfaces and a real inner surface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to a preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings.

As shown in FIG. 1 and Fig. 2, a flat panel for a cathode ray tube is usually manufactured with a transparent glass plate. The panel 20 has an inner surface 22 which is provided with a phosphor surface formed by coating phosphor substances of three red, green and blue colors to be regularly aligned in the shape of dot, and a non-phosphor substance such as graphite coated between the phosphor substances for preventing degradation of contrast and purity due to external incidental light.

Further, in order to improve the luminance of the phosphor surface, an aluminum thin film is evaporated on the phosphor substances.

The phosphor substances of the three red, green, and blue colors are radiated with electron beams reflected by a reflection yoke to emit light of corresponding colors, wherein the electron beams are radiated to the corresponding phosphor substances via a shadow mask 25.

The shadow mask 25 is formed of a metal plate of a fine thickness with hundreds of thousands of holes for passing through the electron beams deflected by the deflection yoke, wherein the holes pass only about 20% of the electron beams, so that the other electron beams collide with the shadow mask 25 to be emitted as heat.

The shadow mask 25 is comprised of a mask surface formed by press processing differently from an aperture grill or a flat tension mask, in which a mask surface is formed by tension force, wherein the shadow mask 25 is

convexly curved facing the inner surface 22 of the panel.

In the meantime, the outer surface 21 of the panel 20 reduces reflected light beams for blocking off the external light and formed completely flat for improving the appearance.

On the other hand, the inner surface 22 of the panel 20 is formed to curve convexly but not spherically, facing the outer surface 21 of the panel for preventing the refraction of eyes E of a user U by the outer surface 21 and the distortion of the screen image 23 realized on the phosphor screen by the refracted eyes E, so as to realize a natural screen image.

In more detail, when the phosphor substances provided on the inner surface 22 emit light to realize the screen image 23 by the radiation of the electron beams, the screen image 23 to be shown by the user U at a distance D apart from the panel by a valid screen width size, which is determined as a proper distance in consideration of a general distance for watching a monitor and a view angle of the user when the user using a computer, is seemed not to be located on the inner surface but between the inner surface and the outer surface by eyes C of the user which are refracted while transmitting the outer surface. Also the eyes E of the user U differ in an incidental angle along the central part and the environmental part of the panel 20. Therefore, the inner surface is formed non-spherically to prevent the screen image 23 from being shown concavely by preventing the screen distortion phenomenon that the screen image 23 is shown concavely by the change of the incident angle.

The non-spherically formed inner surface 22 satisfies the following

formula 1 not to distort the screen image 23 to be shown by the user at the distance D apart from the panel by the valid screen width size.

$$y_2 \leq y_1 \quad \text{.....formula 1}$$

wherein y_1 represents a vertical distance between the outer surface and a refracted screen image on a central axis of the panel, and y_2 represents a vertical distance between the outer surface apart from the central axis of the panel and the refracted screen image.

As above, the panel 20, in which the outer surface 21 is formed flat and the inner surface 22 is formed non-spherically, has a thickness which increase toward the environmental part in comparison with the central part.

Such a difference of thickness between the central part and the environmental part causes the degradation of the luminance of the environmental part in comparison with the central part. In order to resolve the problem, the panel 20 of the present invention is formed of a transparent glass having a high transmission ratio of 60% or more to prevent the degradation of the luminance.

As above, the panel 20 for a cathode ray tube may block off the external light by reducing the reflected light beams and improve the appearance by the outer surface 21.

Further, the inner surface 22 formed non-spherically considering the eyes of the user which are refracted while passing through the outer surface 21, prevents the screen image which is realized between the inner surface and the outer surface from being shown by the user U concavely.

As described hereinabove, the flat panel for a cathode ray tube according to the present invention not only blocks off the external light by reducing the reflected light by the outer surface but also improves the appearance, and the non-spherically formed inner surface makes the screen image realized on the inner surface flat or somewhat convex, thereby achieving a natural image.

Further, the flat panel may be applied for a mask in which a mask surface is formed by the tension force as in the flat tension mask or the aperture grill as well as the mask surface formed by the press processing as in the shadow mask, thereby exhibiting superior compatibility with the existing cathode ray tubes.

While the present invention has been described and illustrated herein with reference to the preferred embodiment thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the spirit and scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention that come within the scope of the appended claims and their equivalents.